No. 688,520. Patented Dec. 10, 1901.

E. HILL.

AIR COMPRESSOR.

(Application filed Oct. 9, 1901.)

(No Model.)

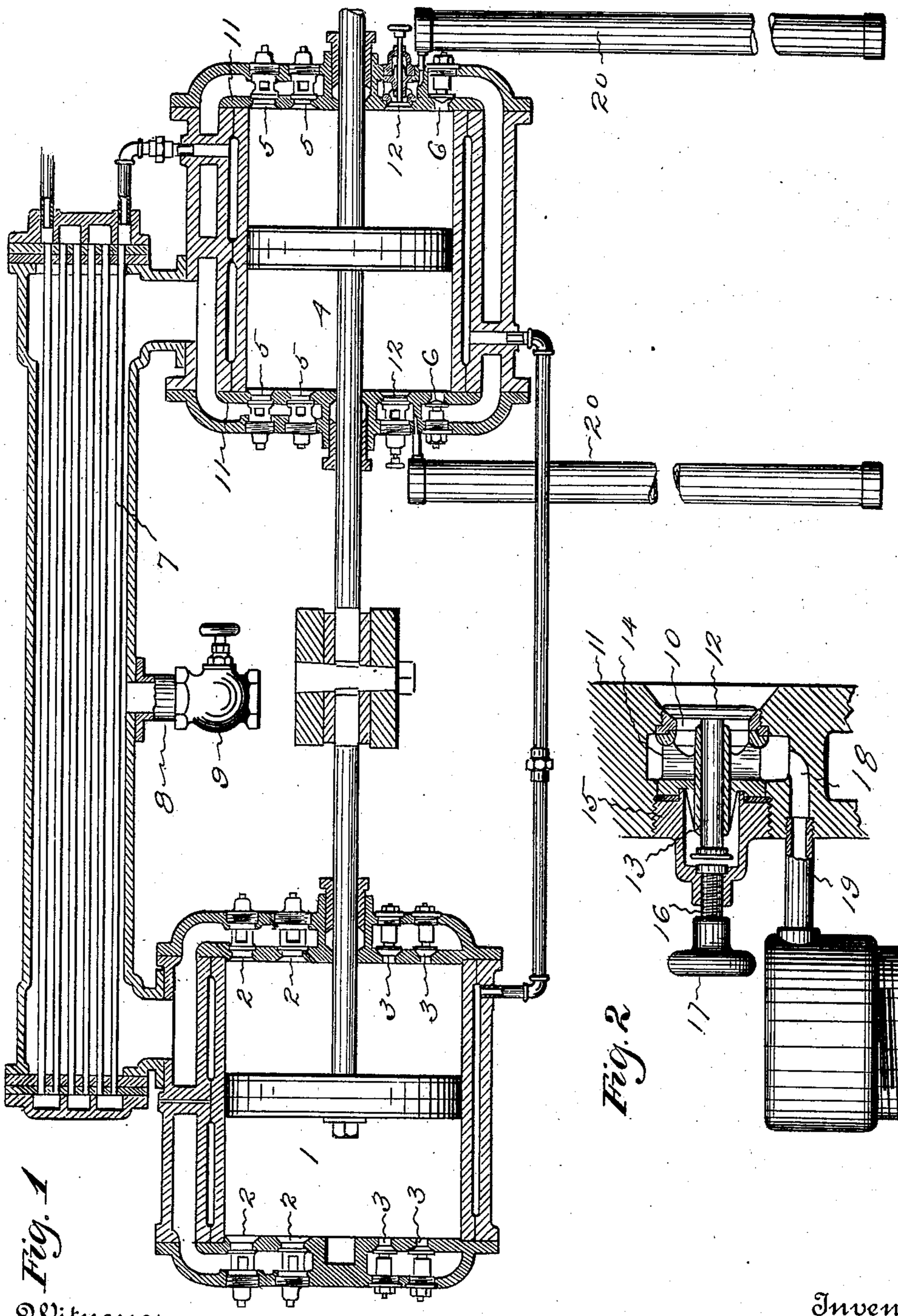

Fig. 1

Fig. 2

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AIR-COMPRESSOR.

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Application filed October 9, 1901. Serial No. 78,051. (No model.)

To all whom it may concern:

Be it known that I, EBENEZER HILL, a citizen of the United States, residing at South Norwalk, in the county of Fairfield and State of Connecticut, have invented certain new and useful Improvements in Air-Compressors, of which the following is a specification.

This invention relates to a multiple-stage compressor which is so built that air may be drawn off at different pressures coincidently without interference—for instance, at low pressure for operating a mine-pump, when necessary, and simultaneously at high pressure for driving mine-locomotives, as desired.

The object is to so construct a compressor that air may be drawn from an intercooler or pipe connecting two cylinders at a predetermined pressure for any length of time without any practical reduction of pressure in the interduct from which the lower-pressure air is drawn and without interfering with the working of the higher-pressure cylinder of those that the tapped interduct connects.

This invention is applicable to a two, three, or greater stage compressor, and it resides in a multiple-stage compressor with the higher cylinder of the two that are connected by the interduct that is tapped communicating with an auxiliary reservoir having substantially the capacity of the momentary discharge through the outlet from the interduct and having a valve that is opened and closed for establishing or shutting off communication between the auxiliary reservoir and the higher-pressure cylinder as the low-pressure air is used or shut off.

In the accompanying drawings the invention is represented as embodied in a two-stage compressor.

Figure 1 is an elevation, with parts cut in section, of the air-cylinders of such a compressor; and Fig. 2 is a view, on larger scale, of a portion of an auxiliary reservoir, showing its valve and connection with the high-pressure cylinder.

The double-acting low-pressure air-cylinder 1 has at each end common inlet-valves 2 and outlet-valves 3. The double-acting high-pressure air-cylinder 4 at each end has common inlet-valves 5 and outlet-valves 6. The low and high pressure cylinders are connected by an ordinary intercooler 7. This intercooler has an outlet-pipe 8, through which air at low pressure may be drawn when the valve 9 is open.

In a pocket 10 in the head 11 at each end of the high-pressure cylinder is an inwardly-opening valve 12 with a stem 13, that is movably supported by a frame 14, held in the head by a plug 15. A threaded spindle 16 turns in a threaded socket in the plug, with its inner end adjacent to the end of the valve-stem. The spindle has a handle 17, by which it may be turned, so as to engage the stem and hold the valve open. A passage 18 leads from each pocket to a pipe 19, that is connected with the upper end of an auxiliary reservoir 20. These reservoirs are designed to be of such size that they will hold substantially the same quantity of air as is drawn from the intercooler for low-pressure use during each pulsation of the pistons. When the valve 9 in the outlet 8, through which the low-pressure air may be drawn from the intercooler, is shut, air is drawn in, compressed in the first cylinder, cooled in the intercooler, compressed in the second cylinder, and discharged to the high-pressure receiver as usual, the inlet and outlet valves of the high and low pressure cylinders operating in the ordinary manner and the valves 12 remaining closed. When the valve 9 is open, air may be drawn off for use at the pressure in the intercooler. If nothing else is done, as the second cylinder is designed to receive just so much air the withdrawal of air from the intercooler will lessen the volume of air for the second cylinder, and thus cause a fall of pressure in the intercooler and a reduction of the action of the second piston. However, with this machine when the valve 9 is open to draw off air at low pressure the valves 12 are held open, so as to establish communication between the high-pressure cylinder and the auxiliary reservoirs. As the air in the auxiliary reservoirs is substantially equal to the quantity of air that is momentarily drawn from the intercooler, when the high-pressure piston moves back and forth and air rushes in from the intercooler the quantity that is drawn off for low-pressure use is supplied by the quantity in the auxiliary reservoirs—that

is, the air in these reservoirs when the valves 12 are held open pulsates in and out and occupies the space of the air drawn off, so that the volume of air in the high-pressure cylinder remains the same as if none were drawn off from the intercooler. These auxiliary reservoirs can be connected with the higher pressure of any two cylinders of a multiple-stage compressor from between which air is drawn for low-pressure use, and of course they can be used at either or both ends of the high-pressure cylinder. By means of this arrangement of auxiliary reservoirs air can be drawn off at low pressure from any interduct of a multiple-stage compressor without reduction of pressure in them and without lessening the volume of air in the high-pressure cylinder, so that the high-pressure cylinder will operate normally.

I claim as my invention—

1. A compound air-compressor having cylinders, pistons, inlet-valves, discharge-valves, interduct between the cylinders, an outlet from the interduct, an auxiliary reservoir connected with the high-pressure cylinder of the pair that are connected by the interduct that is tapped, and a valve controlling the passage from the high-pressure cylinder to the auxiliary reservoir, substantially as specified.

2. A compound air-compressor having cylinders, pistons, inlet-valves, discharge-valves, interduct between the cylinders, an outlet from the interduct, an auxiliary reservoir connected with each end of the high-pressure cylinder of the pair that are connected by the interduct that is tapped, and a valve controlling each passage from the high-pressure cylinder to each auxiliary reservoir, substantially as specified.

3. A compound air-compressor having cylinders, pistons, inlet-valves, discharge-valves, interduct between the cylinders, an outlet from the interduct, an auxiliary reservoir connected with the high-pressure cylinder of the pair that are connected by the interduct that is tapped, a valve controlling the passage from the high-pressure cylinder to the auxiliary reservoir, and means for holding the auxiliary-reservoir valve open, substantially as specified.

4. A compound air-compressor having cylinders, pistons, inlet-valves, discharge-valves, interduct between the cylinders, an outlet from the interduct, a pocket in the head of the high-pressure cylinder of the pair that are connected by the interduct that is tapped, an inwardly-opening valve located in said pocket, means for holding the valve open, and an auxiliary reservoir connected with the pocket, substantially as specified.

5. In combination with a multiple-stage air-compressor having an interduct that is tapped for drawing air at low pressure, an auxiliary reservoir having a capacity for air substantially equal to the quantity of air that is withdrawn from the interduct for low-pressure use at each pulsation of the pistons, and a connection from the auxiliary reservoir to the high-pressure cylinder of the pair that the tapped interduct connects, substantially as specified.

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